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THE TREND TOWARD A MORE EFFECTIVE USE OF THE LAND AS SHOWN BY THE YIELD PER ACRE OF CERTAIN CROPS

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CONTENTS

	Page
Introduction	1
The awakening national interest in the soil-productivity problem	2
Have yields per acre declined?	2
Purpose and scope of study	3
Sources and character of the data used	4
Trend in crop yields in the United States as a whole	5
Increase in volume of production resulting from rising level of acre-yields	8
Trend of crop yields in European and other foreign countries	10
The trend in yield per acre before 1880	10
Trend of crop yields in Europe during the recent period	12
Maintenance of livestock	13
Trend of crop yields in European and other foreign countries—Contd.	
Increase of food production in western Europe resulting from the agricultural revolution	14
Trend of wheat yields in certain countries characterized by comparatively low yields	15
Regional changes in productivity per acre in the United States as indicated by crop-yield statistics	16
Relation of rising acre-yields to expansion of production in selected regions in the United States	21
Increased production resulting from rise in acre-yield level in these selected regions	23
Summary and conclusions	25
Appendix	27
Literature cited	32

INTRODUCTION

Only in recent years have we begun to regard the problem of agricultural production and its relation to our national food supply from a new viewpoint.

Throughout the period of settlement of our country, which began in earnest early in the nineteenth century and has continued to the present, the westward movement of the frontier of crop production has ever been the focus of national attention. In the 1923 Yearbook of the United States Department of Agriculture this condition was described as follows:

> The dominant characteristic of American economic life has been abundance of land resources. The asumption of this abundance has colored our habits of thought and become the essential foundation of our economic policy both individual and public (*4, p. 415*).[1]

[1] Numbers in italic or parenthesis refer to "Literature cited," p. 32.

How this has colored our thought may be gathered from the popular notions, often encountered, that the productivity of our older farming areas has been declining and that our volume of agricultural production was being maintained or increased solely as a result of new virgin lands brought into use for crop production.

THE AWAKENING NATIONAL INTEREST IN THE SOIL-PRODUCTIVITY PROBLEM

We are beginning to realize, however, that our land area in relation to prospective requirements is limited and that our area of arable land is still more limited. It is true that even at the present time our total crop area is less than half of that estimated as physically capable of being used for crop production (*4, p. 427*). Much of the remaining area, however, includes land which may never be economically reclaimed. Practically all of our good arable land available for use without reclamation is contained in our present crop area. Further expansion of our crop acreage will be on lands poorer or more expensive to reclaim than those already in cultivation.

The realization of this condition is the basis for the recent interest in our population growth and the trend in the volume of our food production.

The rapidity and the magnitude of the westward expansion of our agricultural area in the past has tended to eclipse the changes that have been taking place in the older agricultural areas of the United States. As long as the supply of free or very cheap virgin lands held out there seemed to be very little reason for giving much thought to the period that our agriculture must pass into sooner or later if our growth is to continue. Considered from a national viewpoint, Edwin G. Nourse has well expressed this idea in the following:

> But the bloom of youth is quick to pass, and, after a brief but riotous heyday of virgin fertility, even so new a land as America is rapidly passing into the ageless period of permanent use and productivity wherein true costs of production begin to figure potently, and agriculture passes onto an industrial basis like any other human occupation of using the materials and forces of nature under an administration shrewdly cognizant of their scarcity value and toward the production of the maximum market surplus (*8, p. 474*).

With the greater part of our available agricultural area already in use and a population that is growing steadily, the problem of productivity and soil fertility in their relation to our future food supply is now coming to the fore as one of the most important phases of the study of land utilization.

HAVE YIELDS PER ACRE DECLINED?

Is it true that we have been increasing our agricultural production solely through the expansion of our agricultural area? Have the farmers of the older farming sections as a whole continued the extractive methods of soil exploitation characteristic of the early period of American agriculture? Has there been no progress and taking up of scientific methods of soil management in the older farming areas of our country? From many sources in the past we have heard of and even seen in various localities of the East the abandonment of land formerly used for crop production. Has this condition been general and has it occurred as a result of steadily declining crop yields? Why should yields in the old agricultural

portions of the United States decline while those in the much longer occupied lands of Europe increase? The soils of northwestern Europe are producing high yields, whereas less than 200 years ago the yields on these same soils were actually as low as those realized on some of our poorest soils (*13, p. 93*).

There are individuals who persist in making such comparisons and insist that our agriculture is deteriorating. We are told of yields in former days considerably above those of to-day. These rumors, however, can not be substantiated in the light of available facts. The statistics of the yield per acre of our principal crops (with the exception of cotton) show an upward trend in acre-yields during the last half century. This has occurred in spite of the fact that a not inconsiderable portion of our agriculture is still on an extensive basis, the soils of which are subject to pioneer methods of exploitation.

Long before soil fertility assumed the scope of a national question individual localities encountered the problems that are associated with the transition from a predatory type of agriculture to a permanent-use type. In many sections of the humid eastern portion of the United States pioneer methods of agricultural exploitation have completely disappeared, and, as economic conditions permitted it, scientific methods of production have replaced the cruder methods of former days. Entering on a period of permanent use the productive capacity of the soils of the East has been greatly increased and is now producing yields considerably above those of the early period of the agricultural history of these sections.

PURPOSE AND SCOPE OF STUDY

In view of the fact that our agricultural frontier can no longer be pushed farther to the west, although much land still remains to be turned by the plow, the productive capacity of our soils is more than ever (as has been pointed out above) becoming a subject of study and concern. To correct the notion that our soils are steadily being exhausted, that our agriculture is deteriorating, it is desirable to examine the facts and determine both the present situation and the past trend in productivity, as far as it can be shown by the acre-yields of some of our principal crops.

The purpose of this study is primarily to show the past trend in the yield per acre of certain of our food and feed crops, and to compare the general level of yields at present with those at different times in the period covered by the data, in order that we may see a little more clearly how much of the increased supply of certain foods and feeds has come from increasing yields of these crops and how much from increasing acreage.[2] It is dangerous to hazard any prophecies as to the future, nevertheless an examination of the trend in yields in the past may give some idea of what we may expect; and even a general idea of what may be expected with reference to crop yields will be helpful in estimating the need for more crop land in the future.

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[2] The yield data for corn, wheat, oats, and potatoes are presented in this bulletin. These crops, excluding hay, comprise the most important of our food and feed crops.

SOURCES AND CHARACTER OF THE DATA USED

The period for which crop-yield statistics are available is relatively short, not only in the United States, but in Europe. Modern crop-reporting systems are largely a development of the second half of the last century. During the last 50 years the application of statistical science to the yield of crops has furnished us with a basis for determining the changes in acre yields realized on many of the large agricultural areas of the world.

Prior to 50 or 60 years ago the literature of crop yields is scant and fragmentary (except for official statistics for France since 1815). The small amount of material available consists largely of the personal observation of certain men. These individuals based their estimates on observed yields for relatively small areas and on a small number of cases. In addition to this there are also records from some farm estates in various countries.

In the United States the two principal sources of information on crop yields are the estimates of the United States Department of Agriculture and the reports of the United States census. It was not until after the Civil War that the Department of Agriculture began the publication of annual estimates on crop yields. The questionnaire of the Tenth Census in 1880 included questions on both acreage and production of crops, making available for the first time crop-yield data based on actual enumeration.

During the first years of the publication of the yield estimates of the Department of Agriculture, owing to various imperfections of the system and an inadequate number of reports on which the estimates were based, the estimated crop yields were probably larger than the actual yields. However, the degree of this bias can not be determined with any degree of certainty, although the results of the Federal census of 1880 indicate that previous to that time the yield estimates published by the United States Department of Agriculture were too high. The existence of this bias prior to 1880 was discussed and graphically shown by Milton Whitney (*14*) in 1909, and also was indicated in a chart showing the comparative crop yields from 1866 to 1912 for the States east of the Mississippi River, in a study published by the New York State Agricultural Experiment Station (*12, p. 191*). Since 1885 these estimates have been much more accurate, and at the present time are based on numerous reports from every county in the United States of any agricultural importance.

Another source of crop-yield statistics in the United States, covering a considerable period, is that available from the annual reports of the agricultural or statistical organizations of various States. Among these, Ohio, Kansas, and Iowa have furnished a continuous series of annual reports for the longest periods. The accuracy of some of these reports for the period extending at least up to 1890 has been questioned by many on the ground of imperfections in the system of getting the county returns and the making of the estimates. But the quality of these reports has improved in recent years and in some cases are now considered to be free from serious error. These reports are valuable in that they furnish a basis for determining some of the changes that have occurred in the agriculture within the boundaries of these States. Through cooperation of the United

States Department of Agriculture and many of the States, annual crop-yield figures by counties are now available for much of the United States.

For foreign lands, including the countries of northwestern Europe, little was available in the way of statistics of yield until the last quarter of the last century. Official publication of crop-yield figures in western and central Europe began in the seventies and eighties with one exception, France, where yield estimates have been available since 1815.

The materials cited above furnish practically the only official and authoratative data available on the history of crop yields for countries and minor civil divisions.

TREND IN CROP YIELDS IN THE UNITED STATES AS A WHOLE

During the last half century great changes have been taking place in American agriculture. An enormous expansion of the area of land in farms has occurred as our agricultural frontier moved westward, and this continued expansion of the area in farms, improved land in farms, and land in crops has led most of us to believe that the increased volume of production was solely a result of the expansion in the crop area. (Fig. 1.)

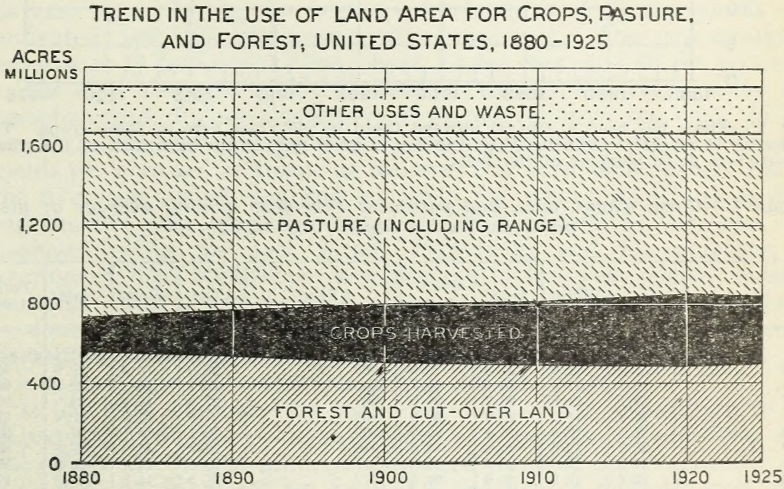

FIG. 1.—The area of land in harvested crops steadily increased up to 1920 at the expense of forest and cut-over land on one hand and of pasture on the other hand. During the war period the expansion of the crop area was mostly at the expense of improved pasture. The 1925 census revealed a contraction of 19,000,000 acres in the harvested-crop area as compared with 1920

However, a consideration of the trend in the acre yields of our important food and feed crops will show that a not inconsiderable increase in the volume of production of those crops resulted from the gradual rise in acre-yields.

Table 1[3] and Figure 2 show the trend in yield per acre in the United States from 1885 to date for corn, wheat, oats, and potatoes.

[3] These averages are based on the actual annual yields taken as a 5-year moving average centered on the middle year. For actual annual yields, 1883–1925, see Appendix, Table I.

The data are presented as moving averages to smooth the sharp variations that occur from year to year, principally as a result of weather conditions.[4]

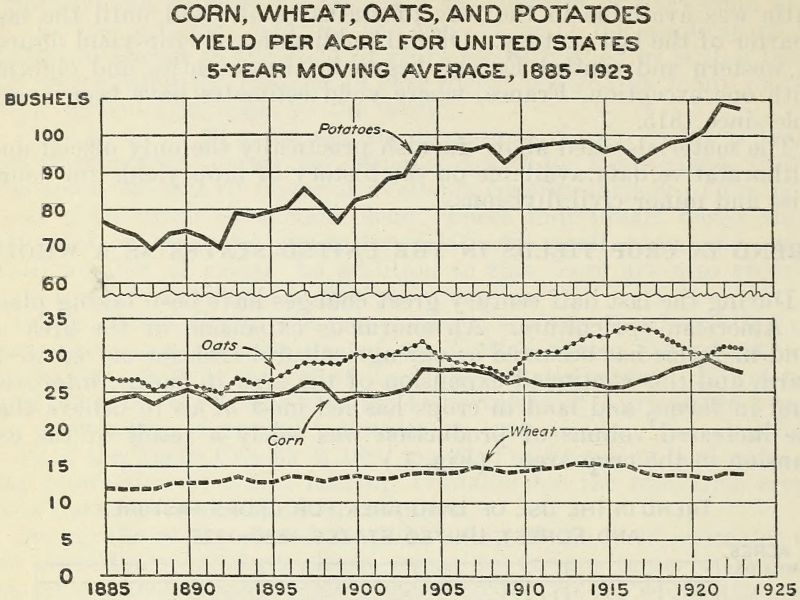

FIG. 2.—There has been a general upward trend in yield per acre of these crops. The decline in wheat yields after 1916 was due in great part to the expansion of the wheat area into drier portions of the West

TABLE 1.—*Corn, wheat, oats, and potatoes: Five-year moving average of yield per acre, United States, 1885–1923*

Year	Corn	Wheat	Oats	Potatoes	Year	Corn	Wheat	Oats	Potatoes
	Bushels	*Bushels*	*Bushels*	*Bushels*		*Bushels*	*Bushels*	*Bushels*	*Bushels*
1885	23.4	11.9	27.0	76.9	1905	28.0	14.0	29.9	96.3
1886	24.1	11.8	26.6	74.7	1906	28.1	14.2	29.2	96.5
1887	24.5	11.8	26.7	73.0	1907	27.9	14.9	28.9	95.8
1888	23.4	11.9	25.3	68.9	1908	27.6	14.7	28.4	97.1
1889	24.5	12.5	26.1	72.9	1909	26.2	14.1	27.1	92.8
1890	25.2	12.8	26.0	74.0	1910	26.7	14.4	29.8	96.4
1891	24.5	12.8	25.5	72.3	1911	26.0	14.7	30.6	97.2
1892	22.8	12.9	24.9	69.6	1912	25.9	14.8	30.5	97.8
1893	24.1	13.4	26.9	78.7	1913	26.0	15.4	31.7	98.3
1894	24.3	12.8	26.1	78.2	1914	26.1	15.4	32.8	98.2
1895	24.5	12.8	26.7	79.4	1915	25.6	15.0	32.7	95.7
1896	25.0	13.6	27.8	80.4	1916	25.7	15.1	33.8	96.8
1897	26.3	13.4	29.0	85.4	1917	26.4	14.3	33.7	92.9
1898	26.2	12.9	29.0	81.6	1918	27.0	13.7	33.2	95.7
1899	23.8	13.4	28.9	76.5	1919	28.1	13.8	31.9	98.0
1900	24.5	13.7	30.3	82.1	1920	28.5	13.7	30.5	98.9
1901	24.5	13.3	30.0	83.7	1921	29.5	13.3	30.0	101.5
1902	24.8	13.3	30.2	88.2	1922	28.3	14.0	31.2	108.7
1903	25.4	13.9	31.0	89.1	1923	27.7	13.9	30.9	107.4
1904	28.1	14.1	32.0	96.2					

[4] When the nine principal crops are averaged together, the composite curve trends downward after 1903–1907 (*4, p. 464*). This is due mainly to the predominant influence on the curve of the large decrease in the yield per acre of cotton caused by the boll weevil.

Notwithstanding an enormous increase in acreage of these crops during the period covered by the data, the yields indicate a general upward trend. The increase in the annual harvested acreage for these crops is shown in Table 2.

TABLE 2.—*Increase in the average harvested acreage of corn, wheat, oats, and potatoes, 1885–1889 compared with 1920–1924*

Crops	Average annual acreage 1885–1889	Average annual acreage 1920–1924	Percentage increase
	Acres	*Acres*	*Per cent*
Corn	73,796,000	102,737,000	39
Wheat	35,911,000	59,836,000	67
Oats	25,536,000	42,503,000	66
Potatoes	2,409,000	3,814,000	58

A considerable part of this expanded acreage, especially in the case of wheat, was on soils that produced yields below the national average for that crop.

The average yields at the end of the period compared with the beginning show a rise of 4.3 bushels for corn, 2 bushels for wheat, 3.9 bushels for oats, and about 30 bushels for potatoes (Table 1). Several times during the period a tendency to declining yields was indicated, but this was apparently temporary. The percentage of increase is 18 for corn, 17 for wheat, 14 for oats, and 39 for potatoes.

The final averages shown in Table 1, that is, the averages for the various crops during the five-year period centered on 1923, do not mark the highest average yields attained to date. Higher average yields per acre are indicated as follows: For corn, 29.5 bushels during the five-year period centered on 1921; for wheat, 15.4 bushels during the five-year period centered on 1913 and 1914; for oats, 33.8 bushels during the half decade 1914–1918; and for potatoes, an average of 108.7 bushels per acre during the five-year period centered on 1922. The lower yield of wheat and oats in the last few years is doubtless to be explained in part by the lower prices obtained since 1921, which, at the higher wages paid farm labor, did not permit so thorough cultivation as during the war years.

It has been suggested by some individuals that in addition to the depressing influence resulting from the expansion of our crop area onto drier and poorer lands, the upward trend of our crop yields has tended to be depressed by declining fertility of our old crop land. This theory can not be substantiated by the trend in yield of these crops in most of the older, humid portions of the United States. Whitney, Schreiner, and others have stated that in general it has been almost a natural process for a soil to increase in fertility under intelligent human occupation. There are indeed many local instances where soil deterioration, through ignorance, inertia, and economic pressure has occurred in the past, and is still to be found. To quote Doctor Schreiner:

> It is true that the soil can be robbed of its store of available and soluble mineral plant food constituents by the carrying away of the crops from the land, but this so-called robbery is small, statistically almost insignificant, in

comparison with the natural processes which have brought the fertility of the soil to its present state of dynamic equilibrium with its climatic environment (*11, p. 116*).

A consideration of the crop yield statistics of the various farming regions of the United States indicates that most of the increases in acre-yield in the United States occurred in the older farming regions east of the Mississippi River. This point was graphically illustrated by Professor Warren in a study published in 1914 (*12, p. 191*).

The greater changes that have occurred in the yield level of these crops in certain of the older farming regions of the United States are somewhat concealed in these national trends. These regional changes will be discussed later.

INCREASE IN VOLUME OF PRODUCTION RESULTING FROM RISING LEVEL OF ACRE YIELDS

Although it is recognized that a great part of the increasing volume of production of our staple food and feed crops has, of course, been the result of expansion onto new lands, nevertheless, the effect of the rising acre-yield level in increasing our volume of agricultural production has probably been consistently underestimated.

The changes in the combined acreage and total production, during the last four decades, for corn, wheat, oats, and potatoes, are indi-

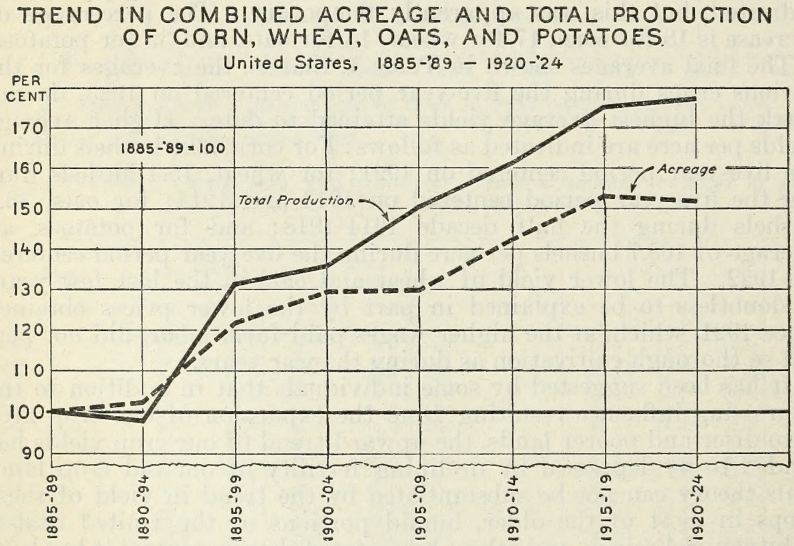

FIG. 3.—The curves show that the total volume of production of these crops increased much more than the total acreage in these crops as a result of the rising acre-yields. The spread between the curves measures the increasing productivity of the area in these crops during the period

cated in Figure 3. During that period the combined acreage of these crops was expanded about 52 per cent and the total production of these crops increased 77 per cent. The gradual spread between the two curves is a reflection of the increasing productivity of the area in these crops during the period of 40 years.

Figure 4 shows the composite trend in yield per acre of these crops.[5]

Considering the first 5-year period as a base, the half decade of 1920–1924 indicates a rise of about 17 per cent in the composite yield per acre of the four crops. For the quinquennial periods of 1890–1894 and 1900–1904 there was a decline in the composite yield per acre figures as compared with the yield figures for the half decades immediately preceding. In the former period this was due to several below-average corn and oat crops; in the latter the downward break was in great part due to the disastrously low corn yield of 1901, in which year the yield per acre of corn dropped to 17 bushels per acre.

For the period as a whole, however, the composite yield per acre of these crops displays an upward trend which still continues.

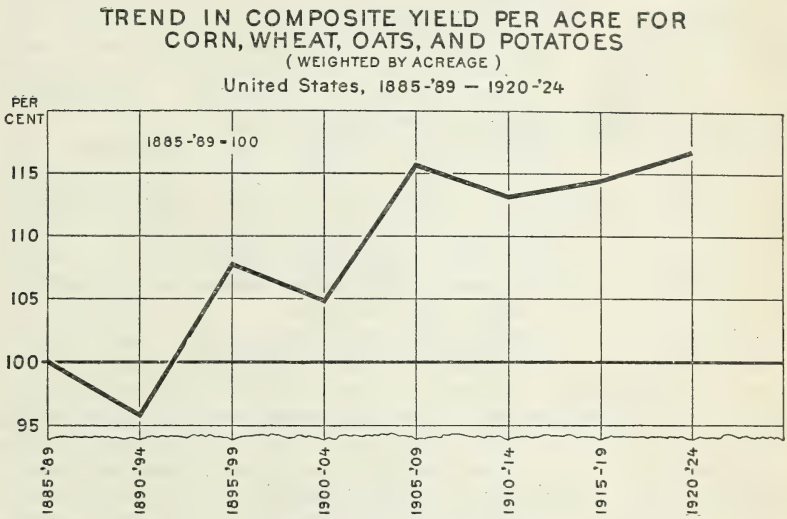

FIG. 4.—For the period as a whole the trend has been upward, the greater part of the composite increase in acre-yields being realized between 1895–1899 and 1905–1909. During the last 15 years the rising trend has been maintained, but at a slow rate of increase

The significance of this indicated rising trend and increase in productivity becomes more manifest when stated in simpler terms. Considered from the viewpoint of volume of production, the rise in the yield per acre of these crops during the period of 40 years resulted in making available annually during the half decade 1920–1924 about 440,000,000 bushels more of corn, 120,000,000 of wheat, 165,000,000 of oats, and 115,000,000 of potatoes—in all over 800,000,000 bushels more than would have been realized under the yield level prevailing at the beginning of the period.

Viewing this increase from still another and perhaps more human angle, the increase in total production as a result of the rise in acre-yield level provided the population of the United States an-

[5] The yield figures on which this index is based have been weighted by the acreage devoted to these crops in each of the quinquennial periods.

nually with about 7 bushels more of these crops per capita than would have been available under the acre-yield level of the base period 1885–1889.

TREND OF CROP YIELDS IN EUROPEAN AND OTHER FOREIGN COUNTRIES

A mere glance at the present-day statistics of yield per acre of crops in the central and northwestern European countries reveals a relatively high level of productivity. But many individuals in the past, and even at the present, either misconstrue or do not fully understand the significance of the higher yields obtained in these countries. It is desirable to recognize the danger of unqualified comparisons of yields in individual European countries and the United States (*4, p. 466–7*).

To understand fully the significance of these high yields of the present day and the metamorphosis of European agriculture during the last century, the problem must be viewed with the changes brought about by the industrial revolution and the accompanying increase in European population as a background.

It was not until after the Civil War that cheap American grain attained importance as a factor to be considered in European agricultural organization. For some time previous (in the case of England almost a century), the increasing demand for food to supply the needs of the growing population resulted in rising prices, making possible the beginning of the development of the intensive type of agriculture in northwestern Europe.

With only a limited and fairly well-occupied area available, the required increase in volume of production could come only from an increase in production per acre. The rising level of productivity previous to 1870 proceeded without any great complications, owing to the fact that cheap American grain was not yet available on a large scale. By that time England had already attained practically the full development of its "high farming." On the continent, however, during the last 50 years, especially in Germany, government subsidies stimulated the continued development of intensive agricultural methods of production (*5, pp. 45–56*).

THE TREND IN YIELDS PER ACRE BEFORE 1880

From the rather scant data available for the period preceding the modern era in Europe it is evident that crop yields were at a very low level. In England during the Middle Ages wheat yields ranged from 6 to 10 bushels per acre (*2, p. 899*). On the continent yields were probably not any higher. Under the common field system the soils had long before the end of the medieval era lost their power to produce more than 6 or 8 bushels of wheat per acre. With the aid of the fallowing practice farmers were just barely enabled to keep their soils in a rough condition of equilibrium on the basis of even these small yields.

The period from the latter half of the eighteenth to the middle of the nineteenth centuries marked the beginning of the great changes in European agricultural methods. This period has been described as the agricultural revolution or renaissance. In brief, it meant the

readoption of methods and practices employed in the times of the Romans.

As a result of the inclosures an opportunity was made available for certain changes in English agricultural practice. The seed for these changes was sown early in the eighteenth century by Jethro Tull, the apostle of cultivation. The teaching of Arthur Young and others in the latter decades of the century and the spread of the inclosures hastened an increasing adoption of the methods that brought about a great increase of crop yields in England. The introduction of root crops and clovers from Flanders, the development of crop rotations, the increase in number of livestock, and the increasing and more efficient use of animal manures were the contributing factors in the increased productivity of the cultivated area. Consequently, by 1815, possibly even earlier, average wheat yields in England had risen to 20 bushels per acre.

The economic justification of the adoption of these improved methods of production and the resulting costs was the constantly rising prices of agricultural products.

> The period from 1780 to 1813 was one of exceptional activity in agricultural progress. Apart from the flowing tide of enthusiasm, landlords and farmers were spurred to fresh exertions and a great outlay of capital and labor by the large returns on their expenditure. All over the country new facilities of transport and communication began to bring markets to the gates of the farmers; new tracts of land were reclaimed; open arable farms and pasture commons were broken up, inclosed, and brought into more profitable cultivation; vast sums of money were spent on buildings and improvement. In spite of increased production prices rose higher and higher, and carried rents with them (*9, p. 210*).

The extended depression that followed the Napoleonic wars, however, kept agricultural improvement at a virtual standstill up to about 1840.

> Livestock was reduced to a minimum; lime kilns ceased to burn; less manure was used on the land; the least possible amount of labor was employed (*9, p. 323*).

On the continent, in Germany, wheat yields rose from 10 bushels per acre in the closing years of the eighteenth century to about 16 bushels by the middle of the nineteenth century (*7, p. 17*).

During the same period a like change took place in France, with wheat yields increasing from an average of about 12 bushels per acre during the decade following the Napoleonic wars to about 16 bushels per acre by the middle of the century (*3, pp. 228–233*).

The transition to the modern era of intensive development of European agriculture occurred shortly after the publication of the work of Liebig. At that time England had just emerged from the long economic depression that had set in at the end of the Napoleonic wars. With a steadily growing demand for food products resulting from a rapidly increasing urban population in England a widespread and increasing general use of improved agricultural methods began to take place. According to Prothero, "The new alliance of science with practice bore rich and immediate fruit." In England crop yields began to rise once more, and by the late eighties wheat yields had risen to a fraction of a bushel less than 30 bushels per acre (*9, p. 361*).

From similar causes the agricultural revolution in northwestern Europe entered on its second period of development; but in Germany and France especially, for various political and economic reasons, the developments of this second period came much later in the century. Among the causes of retardation Doctor Marbut cites the conservatism of the German farmers as a factor explaining the slower and deferred adoption of the new scientific methods (*7, p. 16*).

TREND OF CROP YIELDS IN EUROPE DURING THE RECENT PERIOD

The effects of the widespread adoption of improved scientific methods during recent years and the increasing use of commercial

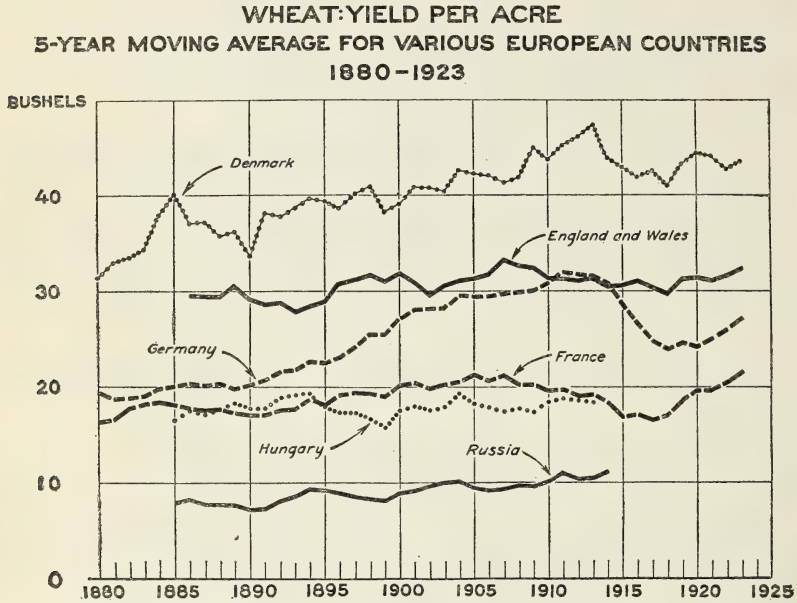

FIG. 5.—There was a general upward trend in the acre-yields of wheat in the various European countries during the last half century. It was not until immediately previous to the outbreak of the World War that Germany attained wheat yields comparable to those of England and Wales. War-time conditions caused a sharp fall in wheat yields in both France and Germany. In the former recovery has already taken place and in the latter wheat yields are again trending upward

fertilizers are apparent in the trend of crop yields. The record of wheat yields in the various European countries during the last 40 or 50 years (fig. 5 and Table 3) shows the great changes that have occurred.[6] The moving averages of wheat yields per acre for all of these countries display generally rising trends. Similar increases occurred in the case of the other cereals and root crops.

In England and Wales the rising trend of wheat yields continued but at a considerably slackened rate, until at about the beginning of the present century a level of 31 or 32 bushels per acre was reached. During the last 20 years yields have been practically stationary.

[6] See Appendix, Table VI, for actual annual yields.

The competition of the cheap grains imported from America during the last 50 years has been one of the prime factors in causing a reduction of area in both grains and root crops. The heavy contraction of the area in roots and green crops is significant in that it is recognized as one of the most important bases in maintaining a high livestock carrying capacity and a high level of productivity per acre (*5, p. 26*). Acre-yields during recent years have been maintained partly by virtue of the fact that some of the less productive lands went back into grass and also through a wider use of pure seed.

TABLE 3.—*Wheat: Five-year moving average of yield per acre, various European countries, 1880–1923*

Year	England and Wales	France	Denmark	Germany	Russia	Hungary	Year	England and Wales	France	Denmark	Germany	Russia	Hungary
	Bush.	*Bush.*	*Bush.*	*Bush.*	*Bush.*	*Bush.*		*Bush.*	*Bush.*	*Bush.*	*Bush.*	*Bush.*	*Bush.*
1880	------	16.2	31.4	19.4	------	------	1902	29.6	19.8	40.8	28.1	9.7	17.6
1881	------	16.5	32.9	18.7	------	------	1903	30.5	20.2	40.4	28.2	9.9	17.9
1882	------	17.7	33.6	18.8	------	------	1904	31.0	20.5	42.6	29.6	10.0	19.3
1883	------	18.1	34.4	19.0	------	------	1905	31.3	21.2	42.3	29.4	9.4	18.2
1884	------	18.4	37.9	19.8	------	------	1906	31.7	20.6	42.1	29.5	9.1	17.9
1885	------	18.1	40.1	20.0	7.8	16.5	1907	33.1	21.2	41.3	29.7	9.3	17.5
1886	29.6	17.8	37.0	20.3	8.2	17.5	1908	32.6	20.2	41.9	29.9	9.6	17.8
1887	29.5	17.6	37.1	20.1	7.7	17.0	1909	32.4	20.2	45.0	30.0	9.5	17.4
1888	29.4	17.7	35.8	20.3	7.7	17.6	1910	31.4	19.6	43.8	30.8	10.0	18.4
1889	30.3	17.2	36.1	19.8	7.6	18.3	1911	31.2	19.7	45.2	31.9	10.9	18.8
1890	29.1	17.1	35.7	20.2	7.1	17.8	1912	31.0	19.0	46.2	31.7	10.3	18.6
1891	28.6	17.1	38.1	20.7	7.2	17.8	1913	31.2	19.2	47.3	31.5	10.4	18.4
1892	28.8	17.6	37.8	21.6	8.0	18.9	1914	30.4	18.4	43.9	30.8	11.0	------
1893	27.9	17.7	38.7	21.7	8.5	19.1	1915	30.6	16.9	42.9	28.6	------	------
1894	28.4	18.7	39.6	22.6	9.2	19.3	1916	31.0	17.1	41.9	26.6	------	------
1895	28.9	18.1	39.4	22.4	9.1	17.9	1917	30.3	16.5	42.5	24.7	------	------
1896	30.7	19.1	38.6	23.0	8.8	17.4	1918	29.7	17.0	41.0	23.8	------	------
1897	31.1	19.4	40.2	24.1	8.4	17.3	1919	31.1	18.5	43.2	24.5	------	------
1898	31.6	19.3	40.9	25.4	8.2	16.7	1920	31.3	19.6	44.4	24.2	------	------
1899	31.0	19.0	38.3	25.4	8.0	15.8	1921	31.0	19.6	44.1	24.9	------	------
1900	31.8	20.1	39.1	27.0	8.8	17.6	1922	31.5	20.5	42.7	25.9	------	------
1901	30.9	20.4	40.9	27.9	9.0	18.0	1923	32.2	21.6	43.5	27.2	------	------

In Germany wheat yields rose from an average of 19.4 bushels per acre during 1878–1882 to a level comparable to that in England in the period immediately preceding the World War, and in France during the same series of years wheat yields rose from 16 bushels to a level of 20 bushels per acre. In Denmark on a comparatively small area wheat yields rose from 31 bushels to over 40 bushels per acre.[7]

As a result of war-time effects, yields declined in both France and Germany. In the former, recovery to the pre-war level has already taken place. In the case of Germany where wheat yields dropped about 8 bushels below the pre-war level, largely as a result of the enforced decrease in the use of chemical fertilizers, yields are now again on an upward trend.

MAINTENANCE OF LIVESTOCK

An important factor in the increasing productivity per acre during the past 50 years in Denmark, Germany, and Great Britain was the maintenance on the land of a large or increasing number of livestock. At the beginning of this period Great Britain was already

[7] See Appendix, Table VI, for actual annual yield.

carrying a considerably greater quantity of livestock per hundred acres of cultivated land than either Germany, Denmark, or France (*5, p. 155*).

From the eighties of the last century onward a great change in the numbers of livestock was effected in Denmark and to a somewhat smaller degree in Germany. The increase in number of animal units per hundred acres of cultivated land in Denmark and Germany was 50 per cent for the former and 29 per cent for the latter up to the period immediately preceding the World War. In the same period the increase in Great Britain was about 16 per cent. The increase in number of livestock per hundred acres of cultivated land in France was almost negligible. In referring to the livestock factor as affecting productivity and yields per acre, Prothero has described the relatively small number of livestock kept on the land in France as "the great deficiency in her rural economy" (*5, p. 155*).

In eastern and southeastern Europe where village farming and the practice of fallowing persisted acre-yields have been low. As a result of the inefficient practices of the peasant farmers, caused in part by the type of land tenure, much less has been accomplished in the way of agricultural improvement than in northwestern Europe. The small amount of improvement reflected in the slowly rising trend in yield per acre of wheat in the 30-year period previous to the Russian revolution is claimed to be the result of better cultivation methods and the use of improved seed on the large Russian estates. The record of wheat yields in Russia during the three decades preceding the revolution shows a rise from a level of about 8 bushels per acre to 11 bushels per acre.

INCREASE OF FOOD PRODUCTION IN WESTERN EUROPE RESULTING FROM THE AGRICULTURAL REVOLUTION

As a result of the revolution in agricultural practices in western Europe there was a great increase in food production. The increased volume of food came not only as a result of the great rise in yield per acre but also from the increase in the area annually available for crops. The growing of a crop on the fields it had been customary to let lie idle or fallow every third year did not add all of the area formerly fallowed to the acreage of grain crops. Much of this area was used in producing roots and other forage crops for the increased numbers of livestock. Taking both crops and livestock products there was undoubtedly a great increase in the total volume of food produced in these countries as a result of the widespread use of the improved methods of production.

However, in spite of the great increase in production in these countries, the rapidly increasing population kept these countries on a deficit basis as far as their food supply was concerned. In the case of England especially this food deficit has been considerable. In fact, as Doctor Marbut has stated in the discussion referred to, "The modern industrial populations of western Europe and eastern America could not now be fed if they had to depend on the soils and production areas to which those factors—i. e.. scientific intensive production methods—have been applied" (*7, p. 26*).

TREND OF WHEAT YIELDS IN CERTAIN COUNTRIES CHARACTERIZED BY COMPARATIVELY LOW YIELDS

Figure 6 shows the trend of wheat yields in Australia, Canada, Argentina, and India. Extensive production methods still predominate in the grain-growing areas of the first three of these countries.

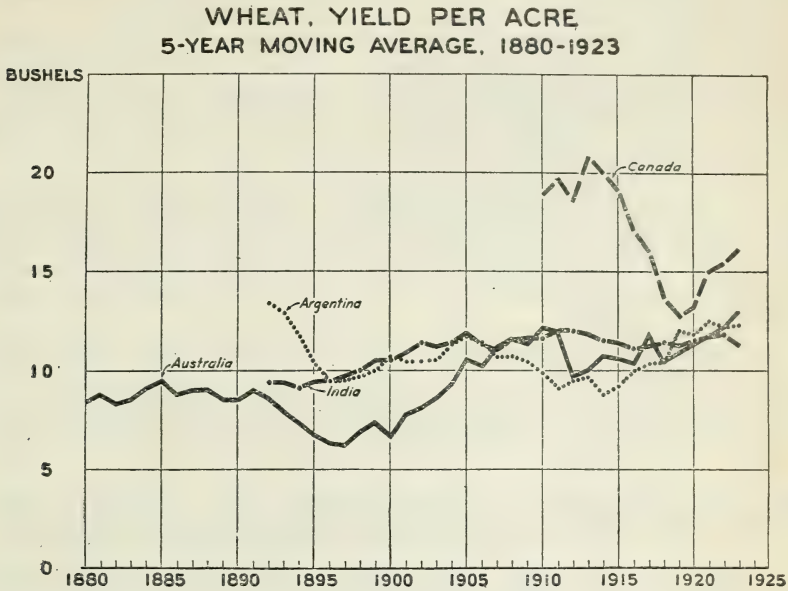

FIG. 6.—During the period of greatest expansion of the wheat area in Australia acre-yields continued to fall. Since the beginning of the twentieth century the general trend has been upward. In Canada when the wheat area spread into the drier lands of the West during the war acre-yields declined rapidly

TABLE 4.—*Wheat: Five-year moving average of yield per acre for various countries, 1880–1923*

Year	Australia	Canada	Argentina	India	Year	Australia	Canada	Argentina	India
	Bushels	*Bushels*	*Bushels*	*Bushels*		*Bushels*	*Bushels*	*Bushels*	*Bushels*
1880	8.4	--------	--------	--------	1902	8.1	--------	10.4	11.4
1881	8.8	--------	--------	--------	1903	8.6	--------	10.5	11.2
1882	8.3	--------	--------	--------	1904	9.3	--------	11.3	11.4
1883	8.5	--------	--------	--------	1905	10.5	--------	11.7	11.9
1884	9.1	--------	--------	--------	1906	10.2	--------	11.4	11.3
1885	9.5	--------	--------	--------	1907	11.2	--------	10.7	11.0
1886	8.8	--------	--------	--------	1908	11.6	--------	10.7	11.5
1887	9.0	--------	--------	--------	1909	11.3	--------	10.4	11.6
1888	9.0	--------	--------	--------	1910	12.1	18.9	9.9	11.6
1889	8.5	--------	--------	--------	1911	12.0	19.7	9.1	12.0
1890	8.5	--------	--------	--------	1912	9.7	18.6	9.5	12.0
1891	9.0	--------	--------	--------	1913	10.0	20.8	9.7	11.8
1892	8.6	--------	13.4	9.4	1914	10.7	20.0	8.8	11.5
1893	7.9	--------	12.9	9.4	1915	10.6	19.1	9.2	11.4
1894	7.3	--------	11.7	9.1	1916	10.3	17.1	10.0	11.1
1895	6.7	--------	10.4	9.4	1917	11.8	16.0	10.3	11.2
1896	6.3	--------	9.5	9.5	1918	10.4	13.7	10.4	11.4
1897	6.2	--------	9.5	9.7	1919	11.0	12.8	12.0	11.2
1898	6.9	--------	9.7	10.0	1920	11.3	13.2	11.8	11.5
1899	7.4	--------	10.0	10.5	1921	11.7	15.0	12.5	11.8
1900	6.6	--------	10.7	10.5	1922	12.2	15.4	12.2	11.8
1901	7.8	--------	10.4	10.9	1923	13.0	16.1	12.3	11.3

In Australia, owing to the expansion of wheat production into areas where the climatic risk was great, yields continued to fall until the closing years of the nineteenth century (Table 4).[8] Since 1900 the record of wheat yields indicates a rising trend. In certain respects the situation in Argentina and Canada is considerably like that in Australia and expansion of the wheat area onto drier lands has tended to depress the acre yields for those countries.

In India the fertility problem has been serious for centuries. The small quantity of available animal manures (the manure is used mostly for fuel) and the poverty of the people, precluding the use of commercial fertilizers, prevent an increase of soil productivity by these means.

In discussing the nitrogen problem Albert Howard states:

> As far as combined nitrogen is concerned, a rough condition of equilibrium has been reached in Indian agriculture. The annual gains and losses are about equal. This is indicated by the records of crop production in the United Provinces from the time of Akbar down to the present day. For the last 300 years the producing power of the soil has not appreciably changed (*6, p. 71*).

During the last 35 years a slowly rising trend is indicated in the record of acre-yields of wheat in India. This is probably the reflection of the educational efforts of the agricultural colleges bringing about somewhat better cultural methods, soil moisture conservation, and the use of improved seed (*6, pp. 71–74*).

REGIONAL CHANGES IN PRODUCTIVITY PER ACRE IN THE UNITED STATES AS INDICATED BY CROP-YIELD STATISTICS

In discussing the trend of acre-yields in the United States reference has been made to the greater changes that have occurred in certain of the older farming regions of the country during the last half century.

Going back to the early decades of the last century there was a general feeling that much of the soils of the East were worn out. The era of virgin fertility in the older settlements was apparently coming to an end.

From the settlers pouring into the regions west of the Appalachians the news was sent back East of the fertility of the soils of the new cheap or free lands. Farm abandonment in the East was pointed to as evidence of soil deterioration, although the changes brought about as a result of industrial development in the United States may have been factors in making crop production on some of this land unprofitable.

Owing to the prevalence of poor and slipshod cultural methods on soils that were low in their original store of fertility, crop yields were low. Agricultural writers of this period alluded constantly to the crude methods in vogue (*1, p. 85*). Inadequate capital for farm improvements, inefficient and wasteful practices, and rising labor costs were prime factors in keeping acre-yields at a low level. With large areas of cheap new farming lands available in the West, it is not to be wondered that progress continued at a very slow rate in the older farming regions. Although the benefits to be derived

[8] See Appendix, Table VII, for actual annual yields.

from the use of improved methods were known to many, they were practiced by few.

But, improvement had to come, and during the third and fourth decades of the century changes were becoming apparent and the use of improved methods began to spread in the East. Falconer describes this period in eastern agriculture as one of soil improvement. "It was urged by many that the adoption of the so-called new system of husbandry was the most effective way for the Eastern States to meet the competition of the West" (*1, p. 259*).

On the other hand, the attitude of the Middle West during that period was altogether different, as may be illustrated by the following editorial in an issue of the Prairie Farmer published in 1854:

> Anyone who sees the agricultural papers of the Eastern States will be struck with one fact concerning them all; and that is, their chief strength is expended on matters relating to preparing the soil. The same fact is evident in all English agricultural literature; every work relative to the subject, even to a book on flowers, is rearly filled with directions for composing the soil, with which the beginning is to be made. Manures, how made, how saved, how kept, how applied—phosphate, superphosphate, "improved" superphosphate, guano, composts, and the like, and related things, fill from one-half to nine-tenths of their pages. What would they think if they had their soil to start with, instead of being obliged to make it? They would then be precisely where we are, with our soil made to our hands, ready to be stirred and receive the seed. Throughout all the Northwest, with but few exceptions, we have the soil to begin with, which these Atlantic shore and English farmers would like to make by aid of their manures (*1, p. 272*).

But improvement in the East went on accompanied by a selective process under which lands that probably never should have been cropped have been going back to forest and pasture use. During the latter half of the century, in many areas, especially in the northeastern quarter of the United States, the results are reflected in the trend of crop yields. Development of suitable rotation systems, more efficient use of animal manures and crop wastes, employment of green manures, liming, commercial fertilizers, development of improved varieties of crop plants, and use of selected seed brought about a higher level of yields in the areas where these methods came into extensive use. Undoubtedly also the reversion of the poorer land to pasture and forest, more especially in New England and New York, was another factor in causing the higher yields indicated by the statistics.

The statistical record of acre-yields for corn, wheat, oats, and potatoes in the various States shows the marked changes that have occurred in the last 40 years.[9] Over the greater part of the humid portion of the United States during that period the acre-yields of corn and wheat especially indicate a consistent upward trend. (Figs. 7 and 8.) In certain areas, however, owing to the original high fertility of the land or, more commonly, to generally poor methods of soil management and a continuance of the methods of the preceding generation through inertia and reluctance to change, even when such methods were no longer economically justifiable, yields have remained stationary.

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[9] See Appendix Tables II, III, IV, V, giving the five-year average yield per acre for corn, wheat, oats, and potatoes, by States, 1885–1889 to 1920–1924, pages 28 to 30, inclusive.

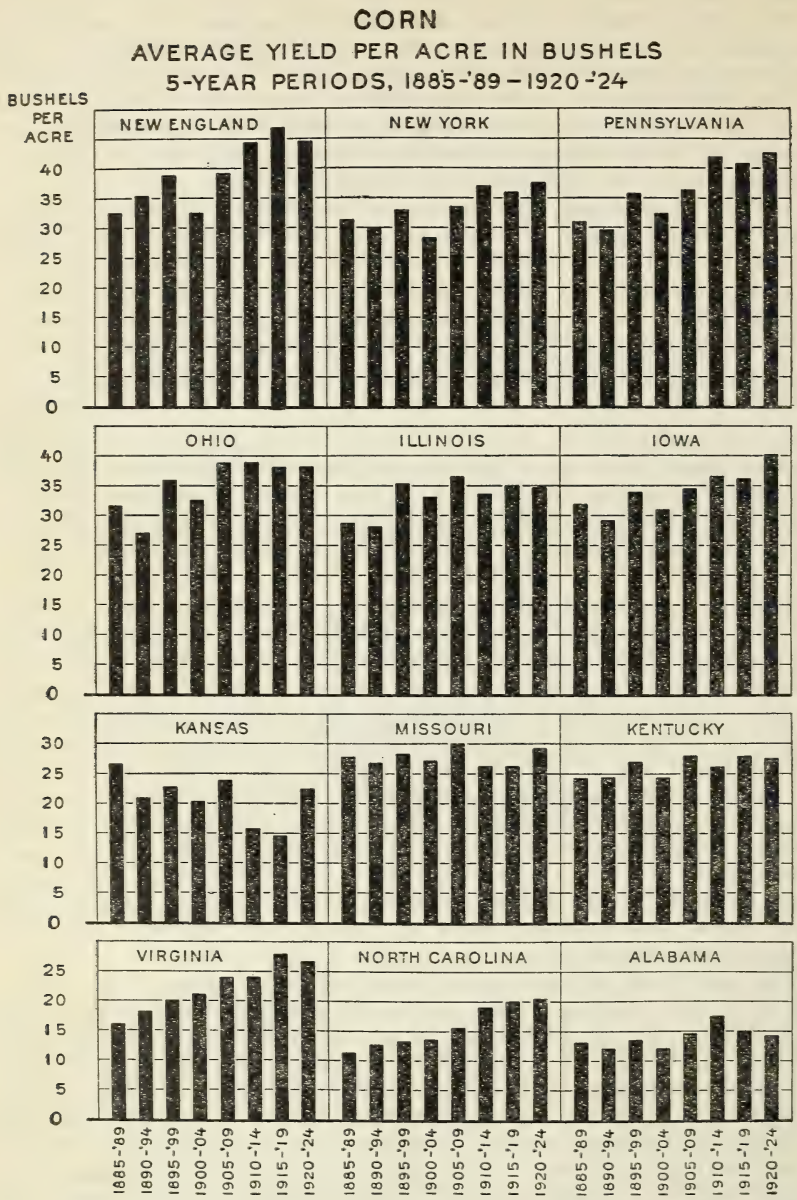

FIG. 7.—Outstanding changes have occurred in the level of corn yields during the last four decades in the northeastern portion of the United States. In the northern portion of the South Atlantic States (Maryland, Virginia, and North Carolina) the rise in the level of corn yields per acre has been relatively even more marked than in the northeastern United States. In the East South Central States yields have remained either stationary or have risen slightly in some States

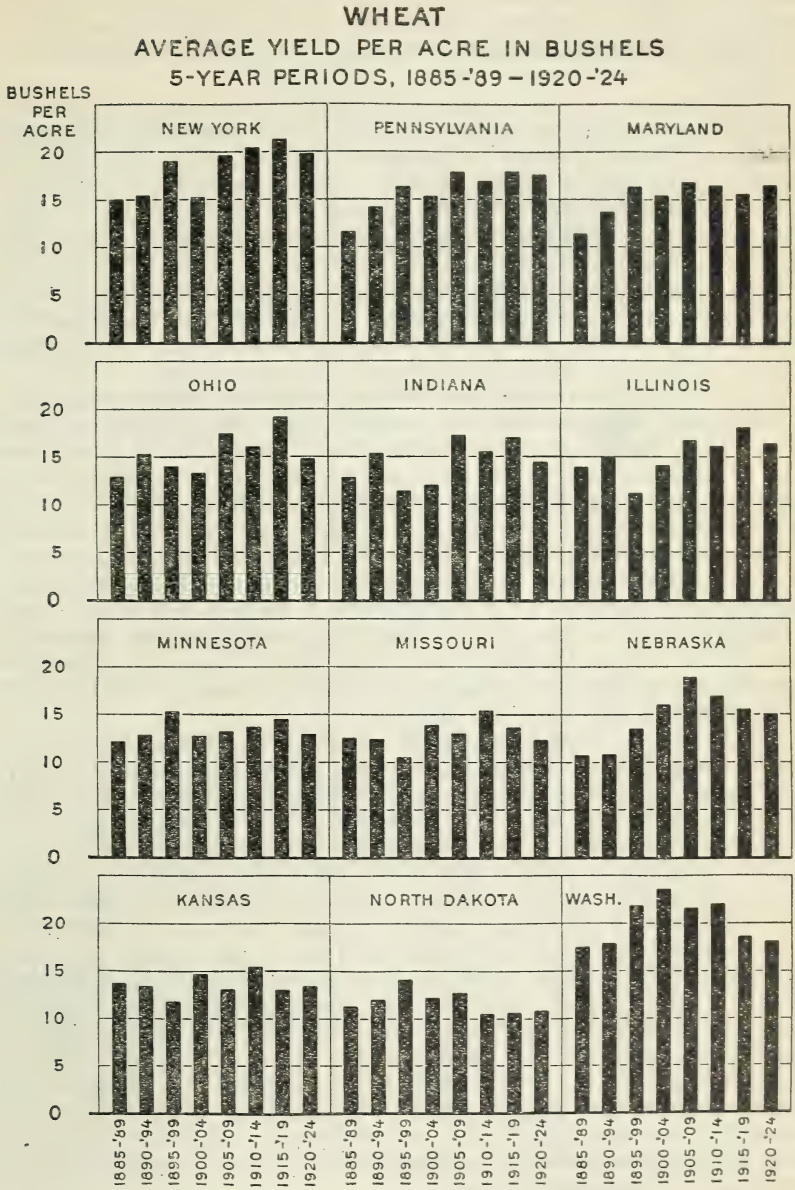

FIG. 8.—As in the case of acre-yields of corn, the trend in wheat yields in northeastern United States (New York, Pennsylvania, Ohio, etc.) has been generally upward. The decrease indicated in Ohio, Indiana, and Illinois during 1920–1924 was a result largely of the unfavorable weather conditions during the years 1920–1922, inclusive. Continued expansion in both the winter-wheat and spring-wheat regions onto drier lands has caused acre-yields to remain stationary or decline. The fall in wheat yields in Washington in recent years is said to be a result of the expansion of the wheat area into the drier portions of the State

In the States where the crop area spread into the semiarid region the effect of this expansion can be seen in the lower crop yield level, which, as already suggested, exerted considerable influence in depressing or holding down the average yields for the Nation as a whole.

The record of the past four decades indicates that the great outstanding changes have occurred in the North and South Atlantic States and lesser changes in the East North Central States. Like changes have also occurred in many portions of the West North Central States, where pioneer agricultural methods have disappeared. In the case of corn yields especially a marked rise has taken place in the northern portion of the South Atlantic States. In a general way these sections comprise the oldest farming regions in the United States. In these regions the soils have already entered or are now entering the period of permanent use, and the pioneer methods of the last century are largely memories only.

The averages for the various States during the last 40 years show the following increases for corn yields: In the North Atlantic States from 6 to 10 bushels per acre; in the East North Central group from 6 to 12 bushels; and in the northern section of the South Atlantic States (comprising Delaware, Maryland, Virginia, West Virginia, and North Carolina) from 9 to 14 bushels per acre. The averages of the quinquennial period of 1885–1889 compared with the averages during the half decade of 1920–1924 in Iowa and Minnesota show, respectively, increases of 8 bushels and 6 bushels per acre. Sarle, formerly of Iowa, has pointed out the consistent and state-wide rising trend of corn yields in that State (*10*). In each of the nine crop-reporting districts during a period of 33 years (1890–1923) the trend of acre-yields has been upward.

The record of wheat yields for the several States shows a rise during the period of from 5 to 6 bushels per acre in the northeastern portion of the United States. In Ohio and other States in the Ohio Valley a marked decrease occurred in the average wheat yields for the period 1920–1924. This was largely the result of unfavorable weather conditions during the years 1920–1922, inclusive. The decrease is probably only temporary, and with normal weather conditions a recovery to the higher level of yields will probably take place.

In Kansas, in spite of the expansion of the wheat area into the semiarid portion of the State, yields have remained practically stationary for the entire period. In Missouri, on a considerably expanded wheat area, yields of that crop have remained low and practically stationary. Statistics of yield per acre seem to suggest that the southern part of the Corn Belt, as represented by Missouri and eastern Kansas, has lagged behind the northern portion, as represented by Iowa and Illinois, in the development of agricultural practices and soil-management methods that tended to raise the acre-yields of the important crops.

In the spring-wheat region the continuance of pioneer methods and the continued expansion of wheat production into drier areas has prevented a rise in the State averages of acre-yields. Since moisture is commonly the limiting factor in crop production in the semiarid portions of the Plains States, it appears probable that this part of the United States will not experience—at least, in equal degree—

the tendency toward rising acre yields which is shown by the statistics for the Northeastern States and for northwestern Europe.

RELATION OF RISING ACRE-YIELDS TO EXPANSION OF PRODUCTION IN SELECTED REGIONS IN THE UNITED STATES

The effects of the rising yield per acre of corn, wheat, oats, and potatoes in increasing the total production of these crops in the northeastern United States is indicated by the index curves shown in Figure 9. The data used in preparing this graph are given in Table 5. The trend in combined acreage and total production of these crops is shown for three selected areas—the Middle Atlantic States, comprising New York, New Jersey, and Pennsylvania; the East North Central States, comprising Ohio, Indiana, Illinois, Michigan, and Wisconsin; and the northern section of the South Atlantic States, comprising Maryland, Delaware, Virginia, West Virginia, and North Carolina.

Taking the first half decade of the 40-year period as a base, the following indexes show the changes that have taken place in the acreage and production of these crops.

TABLE 5.—*Trend in combined acreage and total production of corn, wheat, oats, and potatoes*

[1885–1889=100]

Year	Middle Atlantic States		East North Central States		Northern section of South Atlantic States	
	Acreage	Total production	Acreage	Total production	Acreage	Total production
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
1885–1889	100	100	100	100	100	100
1890–1894	92	92	92	89	95	102
1895–1899	89	107	93	104	90	112
1900–1904	96	110	102	118	91	114
1905–1909	93	117	113	140	89	131
1910–1914	88	121	119	150	91	144
1915–1919	94	128	122	159	101	171
1920–1924	90	131	120	150	87	155

It will be noted that in the two Atlantic regions there has been a decrease of about 10 per cent in the acreage in these crops. In the East North Central group of States the total acreage in these crops during the 40-year period increased 20 per cent. The total production of these crops in all three regions, however, has been greatly increased. When one considers the decrease in acreage in these crops during the half decade 1890–1894, and its effect in decreasing production, it can be seen that the rising trend of the total volume of production of these crops in all three regions has been consistently maintained since the early nineties.

In the East North Central States, the downward break of the total-production curve during the 5-year period 1920–1924 was due in part to the contraction in acreage, but also to the poor wheat yields of 1920–1922, inclusive, and the low corn yield of 1924, occasioned by the abnormal weather conditions prevailing during

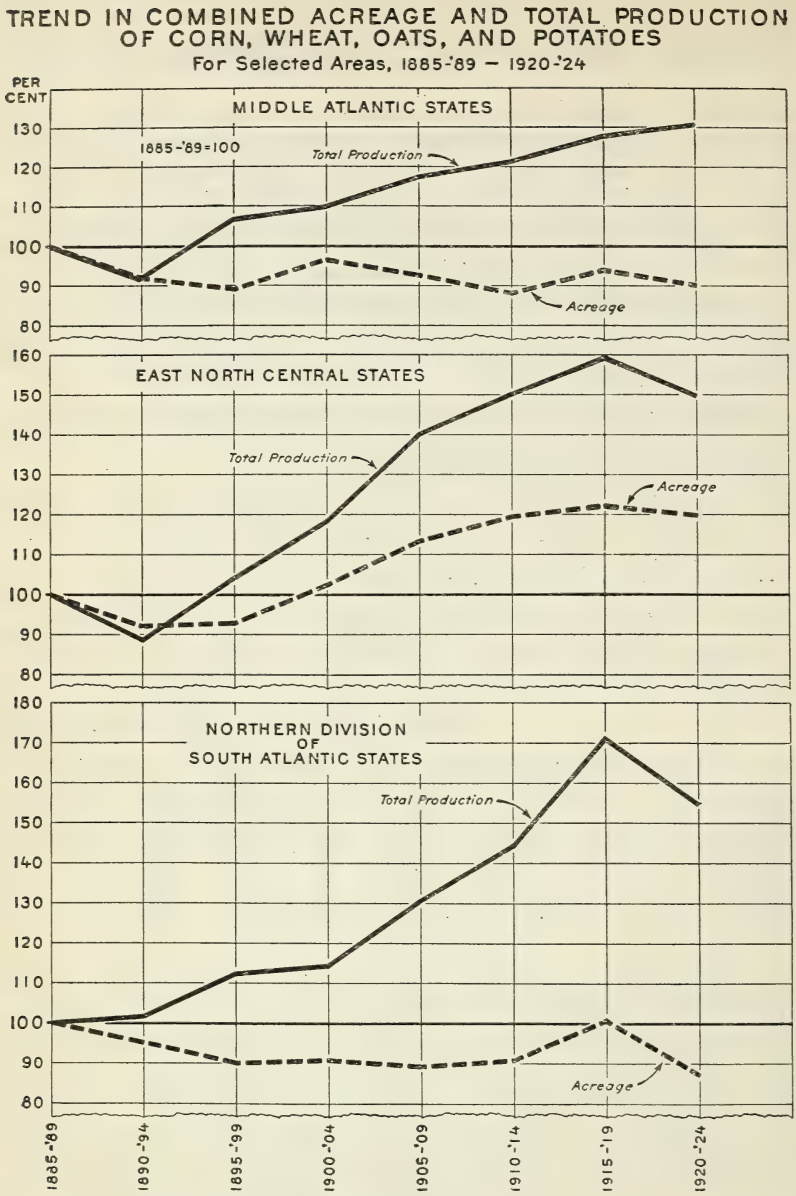

FIG. 9.—The curves show the increase in production resulting from the rising acre-yields in these areas. In the Middle Atlantic States, for instance, production is now 30 per cent greater than 35 years ago, whereas acreage is 10 per cent smaller. During the past 30 years the total acreage in the four crops in the Middle Atlantic States and the northern section of the South Atlantic States (Delaware, Maryland, Virginia, West Virginia, and North Carolina) was practically stationary, if we except the temporary expansion of the crop area during the war. In the East North Contral group expansion of the total area in the four crops continued until recently

those years in this region. In the northern section of the South Atlantic States the decrease in production indicated in 1920–1924 was owing chiefly to the contraction of the area in these crops during that period. Probably of basic importance in both regions have been the low prices for farm products since the war and the high wages of labor, which have compelled farmers not only to cultivate the crops less intensively but also to contract the acreage.

The trend in the weighted composite per acre of corn, wheat, oats, and potatoes during the last 40 years in each of these areas is shown in Figure 10.[10] The data used in preparing this graph are given in Table 6. Considering the entire period the greatest relative rise in acre-yields occurred in the northern section of the South Atlantic States. A considerable rise in acre-yield took place in the other two areas. The following indexes show the changes that occurred in the yield per acre in these regions during the last four decades.

TABLE 6.—*Trend in composite yield per acre for corn, wheat, oats, and potatoes*

[1885–1889=100]

Year	Middle Atlantic States	East North Central States	Northern section, South Atlantic States	Year	Middle Atlantic States	East North Central States	Northern section, South Atlantic States
	Per cent	*Per cent*	*Per cent*		*Per cent*	*Per cent*	*Per cent*
1885–1889	100	100	100	1905–1909	127	124	146
1890–1894	100	96	107	1910–1914	138	126	159
1895–1899	120	112	125	1915–1919	136	131	170
1900–1904	114	116	126	1920–1924	145	125	177

INCREASED PRODUCTION RESULTING FROM RISE IN ACRE-YIELD LEVEL IN THESE SELECTED REGIONS

In discussing the increase in production resulting from the rising acre-yields in the United States during the last 40 years it was calculated that the composite increase in productivity resulted in making available annually during the half decade 1920–1924 about 800,000,000 bushels more of corn, wheat, oats, and potatoes than would have been realized on a like acreage but at the average yield level prevailing during the half decade 1885–1889. Using the same method of calculation for the State groups it will be seen that the rise in the composite acre yields of the four crops during the 40-year period effected a considerable increase in the average annual total production of these crops. The changes resulting from the rise in acre-yields in each of these areas is shown in Table 7.

[10] Weighted by total acreage in these crops. See figure 4, p. 9.

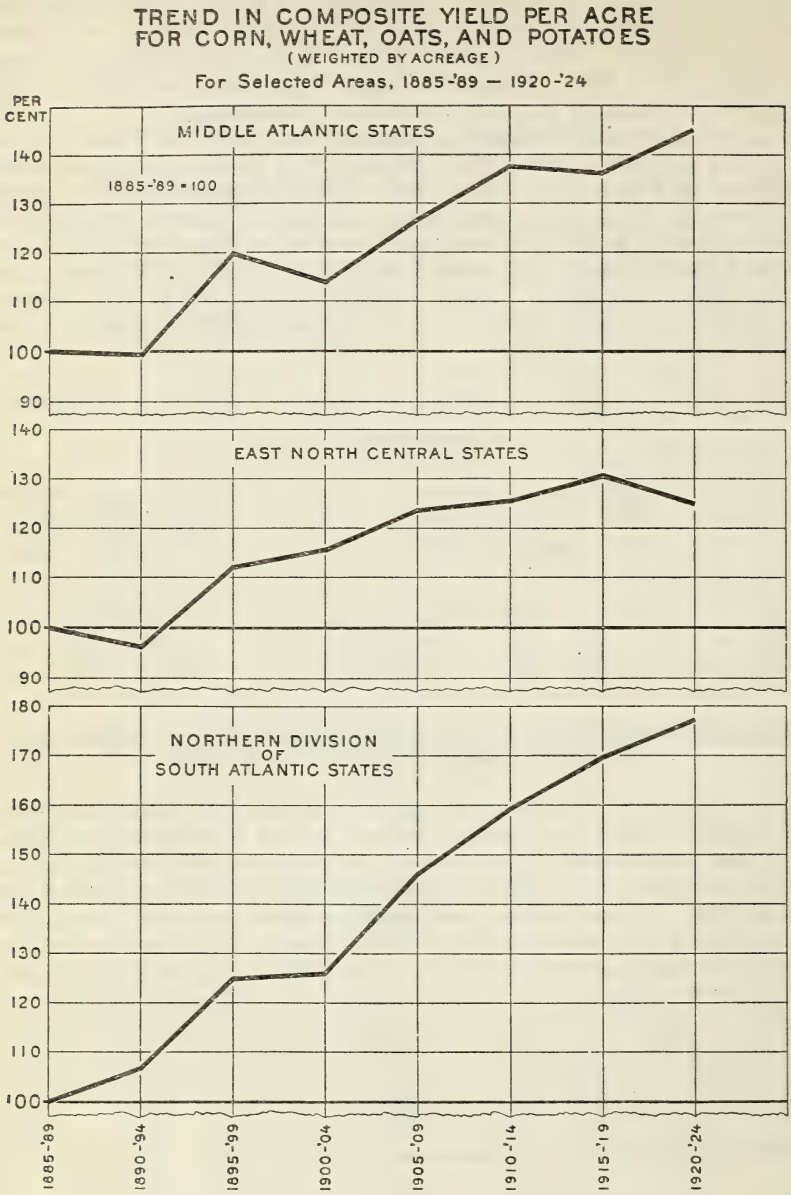

FIG. 10.—The general trend in all three areas has been upward since the early nineties. The downward break in the East North Central area during 1920–1924 was owing in part to unfavorable weather conditions for wheat during the years 1920–1922, inclusive, and for corn in 1924

TABLE 7.—*Actual and theoretical total combined annual production of corn, wheat, oats, and potatoes (average 1920–1924) in selected regions*

[Millions—i. e., 000,000 omitted]

Item	Middle Atlantic States	East North Central States	Northern section of South Atlantic States	Total for three State groups
	Bushels	*Bushels*	*Bushels*	*Bushels*
Actual total annual production of four crops on average acreage utilized annually, 1920–1924	289.9	1,388.9	226.6	1,905.4
Theoretical total annual production of four crops on average acreage utilized annually, 1920–1924, but at average acre-yield level prevailing in 1885–1889	199.7	1,111.3	127.8	1,438.8
Calculated increase in total supply available annually as a result of higher yields	90.2	277.6	98.8	466.6

From the foregoing it is apparent that the rise in yields in these three regions accounted for more than half of the total increase in productivity (because of higher yields of these four crops) in the United States as a whole. It will be noted also that the Middle Atlantic States, the northern section of the South Atlantic States, and a considerable portion of the East North Central States comprise a large part of the oldest cultivated portion of the United States.

SUMMARY AND CONCLUSIONS

Looking backward over the last 150 years we can see the effects of different methods brought into use in the course of the so-called agricultural revolution. In western Europe the period witnessed an enormous increase in productivity owing mainly to the rise in crop yields. As a result, first, of the revival in the use of soil-management methods known to the Romans and after the middle of the nineteenth century by the added developments in the field of agricultural chemistry resulting from the discoveries of Liebig and others, and improvements in technique following research in various branches of natural science, the productive capacity of the soils of northwestern Europe was greatly increased. Wheat yields per acre rose gradually from a level ranging between 6 and 10 bushels per acre in the various countries to a level of 20 bushels per acre in France and over 32 bushels per acre in England and Germany. In the smaller countries such as Denmark, with relatively small areas in grain crops, even higher acre-yields were obtained. The acre-yield of other crops in these countries was also increased considerably.

In the United States, considered as a whole, the statistical record of crop yields per acre for our important food and feed crops during the last 40 years indicates a generally rising trend. Especially in the latter half of this period much of the expansion of our crop area, particularly that occurring in our wheat acreage, was on semi-arid lands with relatively low average yields per acre.

Analysis of the statistics of crop yields of the individual States indicates that the outstanding increase in yield per acre of crops have occurred in the northeastern portion of the United States, including the northern half of the South Atlantic States. It is in these States that, with the passing of the old-time pioneer methods and with an increasing widespread use of improved soil-management

methods and commercial fertilizers, a considerable increase in production has been realized as a result of the rising acre-yields. West of the Mississippi, Iowa stands out as an example where an increasing use of improved practices has brought increasing yields per acre. In both the spring-wheat and the winter-wheat regions of the West, owing to the fact that extensive production methods still continue to be most profitable from an economic viewpoint and as a result of the expansion of the crop area onto drier lands, crop yields have remained either stationary or have declined to a lower level.

As far as indicated by the history of crop yields, both in various European countries and now in the United States, there has been a well marked trend away from extensive agricultural methods and toward the use of scientific methods of increasing soil productivity.

Forecasting the future may indeed be hazardous, but it appears safe to predict that developments in the forthcoming decades, just as in the past, will depend to a great extent on the prices of agricultural products. Rising prices of food products normally would result in increasing intensification and a higher level of soil productivity through the wider use of better cultivation methods, development of suitable rotations, including the growth of legumes, more efficient use of crop residues and animal manures, greater use of commercial fertilizers, and the more common use of selected seed. A period of falling prices of agricultural products may temporarily arrest the advance toward higher standards of production, but the increasing demand of our steadily growing population for food must ultimately result in a level of prices that will economically justify the wider use of improved methods of production. It appears probable, therefore, that the general trend of acre-yields of the crops will continue upward for a considerable period.

APPENDIX

TABLE I.—*Corn, wheat, oats, and potatoes: Yield per acre, United States, 1883–1925*

Year	Corn	Wheat	Oats	Potatoes	Year	Corn	Wheat	Oats	Potatoes
	Bushels	*Bushels*	*Bushels*	*Bushels*		*Bushels*	*Bushels*	*Bushels*	*Bushels*
1883	22.7	12.7	27.7	81.9	1905	29.4	14.7	34.0	87.3
1884	25.8	12.3	22.1	80.9	1906	30.9	15.8	31.0	102.2
1885	26.5	10.4	27.6	77.2	1907	26.5	14.1	23.9	95.7
1886	22.0	12.4	26.4	73.5	1908	26.6	14.0	25.0	86.2
1887	20.1	12.1	25.4	56.9	1909	26.1	15.8	30.4	107.5
1888	26.3	11.1	26.0	79.9	1910	27.7	13.9	31.6	93.8
1889	27.7	12.9	28.3	77.4	1911	23.9	12.5	24.4	80.9
1890	20.7	11.1	20.4	56.7	1912	29.2	15.9	37.4	113.4
1891	27.6	15.5	30.4	93.7	1913	23.1	15.2	29.2	90.4
1892	23.6	13.3	24.8	62.1	1914	25.8	16.6	29.7	110.5
1893	22.9	11.3	23.8	71.7	1915	28.2	17.0	37.8	96.3
1894	19.3	13.1	25.2	63.6	1916	24.4	12.2	30.1	80.5
1895	27.0	13.9	30.2	102.3	1917	26.3	14.1	36.6	100.8
1896	28.9	12.4	26.3	91.4	1918	24.0	15.6	34.7	95.9
1897	24.3	13.3	27.9	67.9	1919	28.9	12.8	29.3	91.2
1898	25.6	15.1	29.3	77.0	1920	31.5	13.6	35.2	110.3
1899	25.9	12.1	31.3	88.6	1921	29.6	12.8	23.7	91.8
1900	26.4	11.7	30.2	82.9	1922	28.3	13.9	29.8	105.3
1901	17.0	15.0	26.0	66.3	1923	29.3	13.4	31.9	109.0
1902	27.4	14.6	34.5	95.5	1924	22.9	16.5	35.6	127.0
1903	25.9	12.9	28.2	85.1	1925	28.5	12.8	33.3	103.8
1904	27.1	12.5	32.2	111.1					

TABLE II.—*Corn: Five-year average yield per acre, by States, 1885–1889 to 1920–1924*

Division and State [1]	Average yield per acre by 5-year periods							
	1885–89	1890–94	1895–99	1900–04	1905–09	1910–14	1915–19	1920–24
	Bus.	*Bus.*	*Bus.*	*Bus.*	*Bus.*	*Bus.*	*Bus.*	*Bus.*
New England	32.5	35.4	38.8	32.5	39.2	44.4	46.8	44.6
Middle Atlantic:								
New York	31.3	29.8	32.9	28.3	33.5	37.0	35.9	37.5
New Jersey	30.4	31.4	34.6	33.3	35.8	37.8	40.2	41.4
Pennsylvania	31.0	29.6	35.7	32.4	36.3	41.9	40.8	42.6
East North Central:								
Ohio	31.6	27.0	35.9	32.6	38.8	38.9	38.1	38.2
Indiana	30.3	28.2	34.4	32.0	37.3	36.9	35.6	35.6
Illinois	28.7	28.1	35.3	33.1	36.5	33.6	35.0	34.7
Michigan	27.7	25.8	32.4	31.6	33.0	33.8	29.5	34.8
Wisconsin	27.6	27.2	34.4	30.6	35.6	37.2	33.1	39.2
West North Central:								
Minnesota	29.1	25.3	30.5	27.0	31.3	35.3	33.3	34.8
Iowa	31.9	29.2	33.9	31.0	34.5	36.5	36.2	40.2
Missouri	27.8	26.8	28.3	27.2	30.1	26.2	26.2	29.3
North Dakota	25.3	14.2	23.3	21.7	25.0	25.7	19.2	26.2
South Dakota	--------	[2] 20.6	23.0	24.4	29.5	25.9	29.6	29.2
Nebraska	32.0	25.1	26.6	26.3	28.6	22.0	25.5	28.8
Kansas	26.5	20.9	22.7	20.3	23.8	15.7	14.6	22.4
South Atlantic:								
Delaware	18.1	21.1	23.8	27.9	29.1	33.5	32.2	32.8
Maryland	22.8	23.2	30.9	31.0	34.1	35.3	37.7	37.7
Virginia	16.0	18.1	20.0	21.1	23.9	24.0	27.9	26.7
West Virginia	22.4	22.0	26.8	24.9	29.0	29.5	31.3	32.9
North Carolina	11.3	12.7	13.3	13.6	15.6	19.0	20.0	20.5
South Carolina	9.7	10.2	9.6	9.4	13.2	18.5	16.8	15.5
Georgia	10.8	11.3	10.8	10.5	12.1	14.8	15.2	13.3
Florida	10.1	9.8	9.7	9.3	10.9	14.4	15.2	13.7
East South Central:								
Kentucky	24.3	24.4	27.0	24.4	28.0	26.1	27.9	27.5
Tennessee	21.2	21.0	23.0	21.0	25.0	24.7	25.5	24.7
Alabama	13.1	12.1	13.5	12.1	14.7	17.5	15.0	14.3
Mississippi	14.6	14.4	15.6	14.1	16.1	19.2	17.3	15.8

[1] States prod ucing less than 1,000,000 bushels annually during the period 1920–1924 not included in this table. New England States grouped together.
[2] Four-year average.

TABLE II.—*Corn: Five-year average yield per acre, etc.*—Continued

Division and State [1]	Average yield per acre by 5-year periods							
	1885–89	1890–94	1895–99	1900–04	1905–09	1910–14	1915–19	1920–24
West South Central:	*Bus.*	*Bus.*	*Bus.*	*Bus.*	*Bus.*	*Bus.*	*Bus.*	*Bus.*
Arkansas	20.0	18.2	18.3	18.2	19.0	20.3	19.2	19.6
Louisiana	16.6	15.7	16.9	16.8	17.0	20.3	18.8	16.6
Oklahoma	-------	-------	-------	23.2	24.6	13.0	16.4	20.3
Texas	18.1	18.5	19.8	17.1	21.5	18.8	18.2	21.6
Mountain:								
Montana	-------	-------	24.3	22.4	24.2	27.5	16.3	20.5
Idaho	-------	-------	-------	[2] 27.9	30.6	31.5	34.4	37.4
Wyoming	-------	-------	20.6	28.9	23.4	21.7	21.4	21.5
Colorado	28.3	19.6	18.1	18.6	20.1	18.7	17.8	17.2
New Mexico	19.6	20.1	22.4	24.6	23.2	23.4	22.4	19.0
Pacific:								
Washington	(2)	-------	16.7	21.8	24.1	27.7	35.2	37.5
Oregon	23.7	24.1	23.9	24.4	26.5	28.9	30.4	31.9
California	27.6	29.5	31.6	29.2	31.6	35.9	33.9	34.7

[2] Four-year average.

TABLE III.—*Wheat: Five-year average yield per acre, by States, 1885–1889 to 1920–1924*

Division and State [1]	Average yield per acre by 5-year periods							
	1885–89	1890–94	1895–99	1900–04	1905–09	1910–14	1915–19	1920–24
Middle Atlantic:	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*
New York	15.0	15.4	19.0	15.2	19.6	20.4	21.3	19.8
New Jersey	12.1	14.3	15.7	15.9	17.6	18.0	18.8	18.7
Pennsylvania	11.6	14.2	16.3	15.3	17.9	16.9	17.9	17.6
East North Central:								
Ohio	12.9	15.3	14.0	13.3	17.4	16.0	19.2	14.8
Indiana	12.8	15.3	11.4	12.0	17.2	15.5	16.9	14.4
Illinois	13.9	14.9	11.2	14.1	16.7	16.1	18.1	16.4
Michigan	15.6	15.2	14.3	12.3	16.7	16.5	18.1	16.7
Wisconsin	11.8	13.2	15.1	16.1	16.6	18.5	19.3	15.9
West North Central:								
Minnesota	12.1	12.8	15.3	12.7	13.2	13.7	14.5	12.9
Iowa	11.1	13.1	15.3	13.9	15.0	19.2	17.6	19.4
Missouri	12.5	12.4	10.5	13.9	13.0	15.4	13.6	12.3
North Dakota	11.3	12.0	14.1	12.2	12.7	10.5	10.6	10.8
South Dakota	-------	10.5	10.9	11.3	13.2	9.8	12.8	11.1
Nebraska	10.7	[2] 10.8	13.5	16.0	18.9	16.9	15.5	15.0
Kansas	13.7	13.4	11.8	14.7	13.1	15.4	13.0	13.4
South Atlantic:								
Delaware	11.4	12.7	15.2	15.7	16.0	17.2	14.3	15.7
Maryland	11.4	13.7	16.3	15.4	16.8	16.5	15.6	16.5
Virginia	7.4	9.2	10.7	9.6	11.9	12.9	12.7	12.2
West Virginia	9.1	10.6	11.5	9.8	12.5	13.3	14.2	12.5
North Carolina	5.5	6.3	7.6	7.5	8.6	10.9	9.3	10.2
South Carolina	5.5	5.6	7.6	7.6	8.2	11.1	10.6	10.5
Georgia	5.7	6.4	8.0	7.9	8.7	11.2	10.4	9.4
East South Central:								
Kentucky	9.2	11.6	11.6	10.9	12.4	13.2	11.3	10.9
Tennessee	6.8	8.6	10.3	9.3	9.9	12.3	9.8	9.9
West South Central:								
Arkansas	8.3	8.4	9.5	9.0	9.4	12.1	11.4	10.6
Oklahoma	-------	-------	14.6	14.3	11.0	14.1	12.1	13.1
Texas	10.5	11.3	12.1	12.7	9.9	14.0	13.8	11.9
Mountain:								
Montana	17.9	20.3	28.0	26.2	24.9	23.3	11.9	13.8
Idaho	17.2	19.6	24.6	21.7	26.4	27.2	21.7	23.2
Wyoming	-------	(2)	23.0	21.8	24.7	25.4	21.8	16.6
Colorado	19.7	17.6	23.4	22.8	25.4	22.1	16.7	14.4
New Mexico	13.6	13.5	20.5	19.4	22.7	21.5	17.0	14.3
Utah	17.0	17.6	23.7	22.4	26.2	24.0	20.5	20.7
Pacific:								
Washington	17.5	17.9	21.8	23.6	21.6	22.0	18.6	18.1
Oregon	15.7	16.7	18.8	18.0	19.7	22.0	18.6	20.0
California	11.5	12.5	12.4	11.3	13.5	17.1	16.1	17.9

[1] States producing less than 1,000,000 bushels annually during the period 1920–1924 not included in this table.
[2] Four-year average.

TABLE IV.—*Oats: Five-year average yield per acre, by States, 1885–1889 to 1920–1924*

Division and State [1]	Average yield per acre by 5-year periods							
	1885–89	1890–94	1895–99	1900–04	1905–09	1910–14	1915–19	1920–24
	Bushels	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*
New England:								
Maine	29.2	33.1	36.5	37.5	36.0	39.3	36.4	37.7
Vermont	32.3	33.7	38.6	36.7	34.8	40.2	36.6	34.9
Middle Atlantic:								
New York	27.0	24.7	30.9	31.4	30.8	32.0	34.1	32.1
New Jersey	25.4	24.4	27.9	27.1	27.3	30.3	33.5	28.6
Pennsylvania	26.7	23.6	29.5	29.7	28.6	31.5	34.8	33.2
East North Central:								
Ohio	32.5	26.6	32.3	36.6	29.7	35.2	38.2	34.0
Indiana	27.8	25.7	28.6	31.0	26.6	31.2	37.5	30.8
Illinois	33.6	29.2	30.4	32.5	29.6	32.6	42.0	33.8
Michigan	32.1	28.0	29.2	33.7	29.1	32.2	34.8	33.2
Wisconsin	30.1	30.0	35.0	33.9	32.6	32.1	41.4	37.1
West North Central:								
Minnesota	32.2	28.3	33.7	34.0	29.3	31.8	34.9	35.5
Iowa	32.2	27.2	34.3	30.2	28.7	35.0	40.2	36.1
Missouri	25.2	21.4	21.9	23.1	22.9	24.7	29.6	24.1
North Dakota	26.4	24.7	27.8	30.1	29.8	25.4	23.0	26.7
South Dakota	-------	[2] 21.6	25.5	33.0	29.2	23.7	34.8	31.5
Nebraska	28.5	21.9	27.1	27.3	24.8	24.8	32.2	29.8
Kansas	26.9	23.6	19.9	26.0	22.2	26.3	26.2	24.6
South Atlantic:								
Maryland	20.5	18.3	23.4	23.8	25.7	28.4	31.2	30.6
Virginia	14.1	12.0	15.8	16.1	17.6	20.2	23.7	21.6
West Virginia	18.5	17.6	22.0	23.0	19.8	23.9	25.1	24.4
North Carolina	10.0	10.6	13.3	13.7	15.1	18.1	18.3	20.2
South Carolina	9.8	11.1	14.1	15.1	18.4	21.3	19.3	23.5
Georgia	10.4	11.8	13.1	14.0	15.9	20.5	19.0	20.0
East South Central:								
Kentucky	19.1	18.0	21.2	21.4	19.1	22.1	23.9	21.0
Tennessee	14.3	12.8	16.5	17.9	18.4	21.7	23.2	20.2
Alabama	11.1	12.5	13.8	14.1	16.2	20.2	18.3	18.7
Mississippi	10.9	12.6	14.2	15.5	17.0	19.8	19.2	18.6
West South Central:								
Arkansas	18.2	16.7	20.1	19.2	19.5	23.8	24.8	23.0
Louisiana	11.2	14.9	15.8	16.2	16.4	21.9	22.7	22.1
Oklahoma	-------	-------	-------	[2] 29.8	27.8	22.7	24.3	24.2
Texas	22.8	24.7	24.2	28.9	28.1	30.7	29.9	25.3
Mountain:								
Montana	31.4	34.6	40.6	41.7	43.3	42.7	29.3	28.4
Idaho	29.4	33.1	38.1	39.9	41.2	44.5	40.7	40.1
Wyoming	-------	-------	-------	33.9	34.2	36.5	36.1	32.5
Colorado	31.9	25.6	31.8	32.4	35.1	38.4	34.0	28.9
New Mexico	-------	-------	-------	-------	-------	34.0	30.2	23.2
Utah	27.7	29.5	36.0	35.7	43.2	46.1	42.5	37.4
Pacific:								
Washington	35.2	36.6	40.6	45.1	48.5	47.5	41.2	46.5
Oregon	26.9	28.6	27.8	27.8	31.7	36.9	34.8	32.8
California	26.6	29.1	28.3	31.8	29.4	35.3	32.5	30.4

[1] States producing less than 1,000,000 bushels annually during the period 1920–1924 not included in this table.
[2] Four-year average.

TABLE V.—*Potatoes: Five-year average yield per acre, by States, 1885–1889 to 1920–1924*

Division and State [1]	Average yield per acre by 5-year periods							
	1885–89	1890–94	1895–99	1900–04	1905–09	1910–14	1915–19	1920–24
	Bushels	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*
New England:								
Maine	94.1	114.9	135.0	168.1	193.6	218.4	183.7	245.5
New Hampshire	84.8	103.8	104.3	112.9	117.7	139.2	114.1	150.5
Vermont	86.1	101.0	120.6	116.5	109.1	133.8	110.1	152.4
Massachusetts	88.3	103.1	108.5	96.3	109.0	121.9	110.9	131.7
Connecticut	74.6	84.0	104.4	92.3	95.4	109.9	94.4	130.8
Middle Atlantic:								
New York	67.6	72.0	88.5	81.6	95.2	100.2	86.9	120.1
New Jersey	73.8	75.8	83.2	96.6	102.9	98.1	110.0	134.9
Pennsylvania	68.7	70.4	86.1	81.4	85.2	89.1	82.6	106.3
East North Central:								
Ohio	67.8	65.2	65.6	81.1	87.6	83.6	72.5	87.5
Indiana	67.5	59.6	66.3	77.2	80.4	78.5	72.8	85.6
Illinois	74.5	55.7	75.6	85.6	83.5	67.0	77.7	76.4
Michigan	69.8	70.7	82.7	89.0	87.0	104.5	75.5	106.4
Wisconsin	77.6	69.0	97.1	94.8	90.1	113.0	90.9	104.4
West North Central:								
Minnesota	87.8	68.6	109.0	82.7	96.9	108.0	93.0	97.8
Iowa	77.1	60.1	88.0	78.5	85.2	78.4	73.9	94.2
Missouri	70.4	66.8	75.8	80.4	81.8	56.9	75.9	81.0
North Dakota	79.4	76.8	105.3	90.5	95.2	98.7	77.1	88.6
South Dakota	------	54.3	81.2	75.2	86.4	78.8	82.3	82.0
Nebraska	77.8	47.8	77.2	82.3	80.4	64.1	81.5	85.3
Kansas	70.2	49.7	70.7	74.4	75.1	51.9	67.3	77.9
South Atlantic:								
Maryland	71.0	62.0	75.4	73.9	89.0	83.1	93.2	86.7
Virginia	64.1	68.9	72.6	75.1	87.1	77.8	111.6	109.7
West Virginia	68.8	67.5	70.6	82.3	89.6	77.4	99.7	105.4
North Carolina	61.5	72.3	70.1	67.2	78.3	70.6	90.2	93.3
South Carolina	60.2	68.9	65.8	77.2	80.6	79.8	91.1	95.2
Georgia	62.2	68.4	53.1	66.4	75.5	74.4	70.4	70.7
Florida	71.1	78.3	66.9	81.3	85.8	85.3	87.4	100.8
East South Central:								
Kentucky	63.8	58.2	67.4	67.9	81.0	65.9	88.8	84.8
Tennessee	63.5	64.4	53.6	59.5	78.2	63.7	80.6	80.9
Alabama	63.9	65.2	64.0	62.3	84.2	80.5	79.2	79.0
Mississippi	65.6	68.4	64.3	72.1	90.7	83.1	80.1	79.1
West South Central:								
Arkansas	69.2	74.8	64.2	67.3	73.6	68.7	70.2	66.8
Louisiana	68.7	62.3	69.5	63.0	66.3	67.1	67.1	65.6
Oklahoma	------	------	------	[2] 76.2	71.9	53.9	61.1	68.3
Texas	62.0	66.1	69.0	65.2	69.3	56.8	60.1	56.5
Mountain:								
Montana	102.3	108.9	122.9	155.2	143.9	144.7	113.7	110.6
Idaho	92.1	125.1	129.7	140.0	154.0	167.0	155.5	179.2
Wyoming	------	------	------	------	148.6	108.1	138.8	107.4
Colorado	84.7	93.5	88.3	121.3	138.9	89.6	143.6	127.2
Utah	82.3	94.1	146.8	144.0	146.6	159.1	165.0	176.2
Pacific:								
Washington	116.1	117.1	138.0	128.1	134.5	142.6	135.9	144.9
Oregon	86.4	103.9	101.1	98.1	108.9	126.9	115.8	100.7
California	81.0	84.7	95.1	117.7	137.9	130.6	138.6	141.6

[1] States producing less than 1,000,000 bushels annually during the period 1920–1924 not included in this table.
[2] Four-year average.

TABLE VI.—*Wheat: Yield per acre for various European countries, 1878–1925*

[Russia and Hungary, 1883–1915; England and Wales, 1884–1925]

Year	England and Wales	France	Denmark	Germany	Russia	Hungary	Year	England and Wales	France	Denmark	Germany	Russia	Hungary
	Bus.	*Bus.*	*Bus.*	*Bus.*	*Bus.*	*Bus.*		*Bus.*	*Bus.*	*Bus.*	*Bus.*	*Bus.*	*Bus.*
1878	------	15.5	35.2	21.4	------	------	1902	32.7	20.2	44.8	30.3	10.9	20.4
1879	------	12.8	32.5	18.7	------	------	1903	30.0	22.7	44.2	29.3	10.4	19.1
1880	------	16.3	36.2	19.2	------	------	1904	26.5	18.6	42.4	29.4	11.4	16.1
1881	------	16.2	20.1	16.8	------	------	1905	32.5	20.8	40.3	28.6	9.4	18.5
1882	------	20.1	33.0	20.8	------	------	1906	33.5	20.4	41.3	30.2	7.7	22.5
1883	------	17.3	42.8	18.1	7.9	14.1	1907	33.8	23.5	43.4	29.6	8.0	14.9
1884	29.9	18.6	36.0	19.2	9.3	15.8	1908	32.0	19.5	43.2	29.7	8.8	17.5
1885	31.2	18.2	40.1	20.2	6.2	16.6	1909	33.5	22.0	38.3	30.5	12.5	14.1
1886	26.7	17.6	37.8	20.7	5.7	15.0	1910	30.1	15.6	43.2	29.6	11.2	19.8
1887	32.0	18.6	43.7	21.9	9.7	20.8	1911	32.5	20.3	56.7	30.6	7.0	20.9
1888	28.0	16.0	27.4	19.5	10.3	19.5	1912	28.7	20.6	37.8	33.6	10.3	19.8
1889	29.7	17.6	36.3	18.0	6.5	12.9	1913	31.2	19.8	50.1	35.1	13.5	19.6
1890	30.6	18.9	34.0	21.4	6.5	19.8	1914	32.3	18.9	43.3	29.6	9.4	13.1
1891	31.1	15.1	39.1	18.4	5.2	18.4	1915	31.2	16.4	48.6	28.6	11.6	18.4
1892	26.1	18.0	41.6	23.8	7.1	18.5	1916	28.6	16.5	39.8	27.1	10.4	------
1893	25.7	15.9	39.3	21.9	10.9	19.5	1917	29.9	13.0	32.8	22.5	------	------
1894	30.5	19.9	34.8	22.6	10.3	18.2	1918	32.9	20.5	45.1	25.4	------	------
1895	26.1	19.6	38.8	21.6	9.2	20.7	1919	28.7	16.0	46.3	19.8	------	------
1896	33.6	20.0	43.4	23.2	8.6	19.4	1920	28.5	18.8	41.1	24.3	------	------
1897	28.8	14.9	40.8	22.6	6.7	11.7	1921	35.3	24.3	50.7	30.3	------	------
1898	34.5	21.2	35.1	24.8	9.3	17.1	1922	31.2	18.6	39.0	21.2	------	------
1899	32.6	21.3	42.8	28.4	8.3	17.8	1923	31.5	20.2	43.3	29.1	------	------
1900	28.3	19.2	42.3	27.8	8.0	17.3	1924	31.0	20.6	39.5	24.6	------	------
1901	30.7	18.5	30.4	23.5	7.6	15.2	1925	32.2	24.4	45.0	30.8	------	------

TABLE VII.—*Wheat: Yield per acre, Australia, 1878–1925*

[Argentina and India, 1890–1925; Canada, 1908–1925]

Year	Australia	Canada	Argentina	India	Year	Australia	Canada	Argentina	India
	Bushels	*Bushels*	*Bushels*	*Bushels*		*Bushels*	*Bushels*	*Bushels*	*Bushels*
1878	8.6	--------	--------	--------	1902	2.4	--------	11.4	9.7
1879	11.6	--------	--------	--------	1903	13.3	--------	12.1	12.7
1880	7.6	--------	--------	--------	1904	8.7	--------	12.4	12.7
1881	7.1	--------	--------	--------	1905	11.2	--------	9.6	9.9
1882	7.1	--------	--------	--------	1906	11.1	--------	11.1	12.1
1883	10.8	--------	--------	--------	1907	8.3	--------	13.5	11.9
1884	9.0	--------	--------	--------	1908	11.9	17.0	10.4	10.0
1885	8.4	--------	--------	--------	1909	13.7	21.5	9.1	10.9
1886	10.0	--------	--------	--------	1910	12.9	14.9	9.4	12.8
1887	9.4	--------	--------	--------	1911	9.6	20.8	9.8	12.3
1888	7.4	--------	--------	--------	1912	12.5	20.4	11.0	11.9
1889	9.6	--------	--------	--------	1913	11.1	21.0	6.4	12.2
1890	8.4	--------	10.5	9.2	1914	2.6	15.7	10.9	11.0
1891	7.7	--------	11.0	9.7	1915	14.3	26.0	10.3	11.7
1892	9.5	--------	14.8	8.4	1916	13.2	17.1	5.2	10.7
1893	9.9	--------	18.1	10.3	1917	11.7	15.8	13.1	11.6
1894	7.5	--------	12.4	9.4	1918	9.5	10.9	10.6	10.4
1895	4.8	--------	8.3	9.2	1919	10.3	10.1	12.5	11.8
1896	4.9	--------	5.1	8.3	1920	7.2	14.4	10.4	12.6
1897	6.5	--------	8.3	9.7	1921	16.1	12.9	13.4	9.7
1898	7.6	--------	13.3	11.0	1922	13.3	17.8	12.0	13.0
1899	7.1	--------	12.7	10.1	1923	11.5	20.0	14.3	12.1
1900	8.5	--------	9.0	10.7	1924	13.1	11.9	10.7	11.6
1901	7.5	--------	6.9	11.1	1925	11.0	17.8	11.2	10.2

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